

The National Fruit and Cider Institute

LONG ASHTON, NEAR BRISTOL.

REPORT OF THE GOVERNORS

*To the Fourth General Meeting of Governors, Members and Associates,
to be held in the Council Pavilion of the Bath and West and
Southern Counties Society, Show Yard, Newport, on
FRIDAY, June 7th, 1907, at 2.15 p.m.*

Governors of the Institute :

ACLAND, Sir C. T. DYKE-, Bart. (Chairman)
BAKER, G. E. LLOYD-
BIFFEN, R. H.
BUNYARD, G.
COOKE, C. W. RADCLIFFE-
DAVIS, HERBERT J.
ELLIOTT, Sir THOMAS, K.C.B.
GIBBONS, H. H.
GRANT, W. J.
GRENVILLE, R. NEVILLE-
HOBHOUSE, RIGHT HONOURABLE H.
HUNT A. E. BROOKE-

MATTHEWS, HENRY
NAPIER, H. B.
OSBOURNE, J. S. SMYTH-
RILEY, JOHN
SHELLEY, Sir JOHN, Bart.
SILLIFANT, A. O.
SLATTER, JAMES
SMITH, J. W.
WATTS, JAMES
WHEELER, E. VINCENT V.
WILLIAMS, T. W.
WOOTTON, JOHN H.

Managing Committee :

NAPIER, H. B. (Chairman)
COOKE, C. W. RADCLIFFE-
GRENVILLE, R. NEVILLE-
HUNT, A. E. BROOKE-

OSBOURNE, J. S. SMYTH-
WATTS, JAMES
WHEELER, E. VINCENT V.

Members :

ACLAND, Sir C. T. D., Bart. Killerton, Exeter.
AMORY, LUDOVIC H. Knightshayes Court, Tiverton.
BERKELEY HUNT AGRICULTURAL SOCIETY. Berkeley, Gloucester.
BAKER, G. E. LLOYD-. Hardwicke Court, Gloucester.
BIFFEN, R. H. The Gables, Histon, Cambridge.
BUNYARD, G. Royal Nurseries, Maidstone.
CADDICK, E. W. Caradoc, Ross, Hereford.
CAREW, C. E. POLE-. Parkhill, Littlehampton, Totnes.
CHAPMAN, G. F. Draycott, Somerset.
CHESTER MASTER, T. W. Knoole Park, Almondsbury, Bristol.
CHEVALLIER, J. B. Aspall Hall, Debenham, Suffolk.
CHILDS, CHRISTOPHER. Boscarn, Love, R.S.O., Cornwall.
COOKE, C. W. RADCLIFFE-. Hellens, Dymock, Gloucester.
CROSSMAN, HENRY. Ham Farm, Yatton, Somerset.
DAVIS, HERBERT J. Hurlingpot, Shepton Mallet.

Members (continued).

- DOWDEN, J. MOSTYN. Messrs. Dowden & Pook, 41, Bermondsey Square, London.
 ELLIOTT, SIR THOMAS H., K.C.B. Board of Agriculture and Fisheries, 4, Whitehall Place, S.W.
 ELLIS, HENRY ARTHUR. Highman, Gloucester.
 FLETCHER, E. Hazeldine, Rydes Hill, near Guildford.
 GRANT, W. J. County Council Offices, Newport.
 GRENVILLE, R. NEVILLE-. Butleigh Court, Glastonbury, Somerset.
 GREW, JAMES. Co. Armagh Cider Co., Portadown, Ireland.
 HAYDON, H. COURTENAY. Chettiscombe, Tiverton, Devon.
 HINCKES, R. T. FOXLEY. Hereford.
 HOBHOUSE, RT. HON. H. Hadspen House, Castle Cary, Somerset.
 HUNT, A. E. BROOKE-. Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W.
 JEFFREY, ROBERT. The Throsk, Succoth Place, Murrayfield.
 KEEL, WATLER W. Stanton Drew, Bristol.
 LETHBRIDGE, SIR ROPER. Exbourne Manor, Exbourne.
 LLOYD, F. J. Muscovy House, Trinity Square, London, E.C.
 LUMLEY AND COMPANY, Ltd. 1, America Square, Minorities, London, E.C.
 MANN, FELIX. 127, Fenchurch Street, London, E.C.
 MARSHALL, L. H. Chippenham, Wilts.
 MATTHEWS, HENRY. Winterbourne, Bristol.
 MID-SOMERSET AGRICULTURAL SOCIETY. Shepton Mallet.
 MONMOUTHSHIRE CHAMBER OF AGRICULTURE. Newport.
 NAPIER, H. B. Estate Office, Long Ashton, Bristol.
 NORTH SOMERSET AGRICULTURAL SOCIETY. Yatton, Bristol.
 OSBORN, C. Woolston, North Cadbury, Somerset.
 OSBOURNE, J. S. SMYTH-. Ash, Iddesleigh, N. Devon.
 PICKERING, P. S. M. Woolacombe, Devon.
 PORTER, W. J. H. Glendale Farm, Wedmore, Somerset.
 PRICE, M. PHILIPS. Tibberton Court, Gloucestershire.
 PULLING AND COMPANY. Bath Street, Hereford.
 RICH, M. W. Sandford, Bristol.
 RICKETTS, E. E. Cape Hall Farm, Stonehouse, Gloucester.
 RILEY, JOHN. Putley Court, Ledbury.
 ROYAL JERSEY AGRICULTURAL SOCIETY. Jersey.
 SHELLEY, SIR JOHN, Bart. Shobrooke Park, Crediton, Devon.
 SHERSTON, Major C. D. Evererech, Bath.
 SILLIFANT, A. O. Culm Leigh, Stoke Canon, Exeter.
 SLATTER, JAMES. Paxford, Campden, Gloucester.
 SMITH, J. W. Thinghill Court, Hereford.
 STUDDY, T. Upper Borden, Petersfield, Hants.
 SUTTON, LEONARD G. Hillside, Reading.
 TAUNTON DEANE HORTICULTURAL AND FLORICULTURAL SOCIETY. Taunton Deane, Somerset.
 WALKER, E. G. F. The Hollies, Chewstoke, Bristol.
 WALKEY, C. E. J. Edgeborough, Staplegrove, Taunton.
 WATTS, JAMES. Backwell, near Bristol.
 WHEELER, E. VINCENT V. Newnham Court, Tenbury, Worcestershire.
 WHITEWAY, HENRY. Fordron House, Whimble, Devon.
 WILLIAMS, T. W. Bank Chambers, Corn Street, Bristol.
 WOOTTON, JOHN H. Byford, Hereford.

Associates:

- ALLEN, J. D. Springfield, Shepton Mallet.
 ALLISON, J. B. Rock Villa, Burrowbridge, Bridgwater.
 BATTEN, GEORGE. Rosebank, Pensford, Bristol.

Associates (*continued*).

BRITTEN, J. E. Old Wood, Tenbury, Worcester.
BROOK, CHARLES. Marksbury, Somerset.
CAZALET, R. H. The Bannut Tree House, Castlemorton, Malvern, Worcester.
CHAPMAN, WALTER. Hewish, Bristol.
COCKS, A. H. Poynetts, Skirmett, near Henley-on-Thames, Oxon.
CROFTS JOHN. Sutton Montis, Sparkford, Somerset.
GIBBONS, HENRY Church Farm, Clutton, Bristol.
JONES, GEORGE. Wood Farm, Welland, Malvern.
LANGFORD, E. W. Wyebridge Stores, Hereford.
MC CREATH, W. D. Quantock Vale Cider Works, North Petherton, Bridgwater.
POPE, JOHN M. Spence Combe, Copplestone, Devon.
RIPLEY, E. G. Beaston House, Bucknall, Shropshire.
STONE, THOS. Wine and Cider Merchant, Axminster.
SYMES, J. H. Coat Farm, Martock, Somerset.
TAVENER, GEORGE E. Budlake, Broadclyst Devon.
TUDWAY, C. C. Wells, Somerset.
WESTON, HENRY Bounds Farm, Much Marcle, Hereford.
YELLAND, W. D. Nethercot, Iddesleigh, Devon.

Directors :

F. J. LLOYD, F.I.C. Muscovy House, Trinity Square, London, E.C. (Hon. Director).
P. T. P. BARKER, M.A. The National Fruit and Cider Institute, Long Ashton.
Bristol (Director).

Superintendent of Fruit Department :

J. ETTLE, F.R.H.S. Stanley Grove Road, Weston-super-Mare.

Hon. Treasurer :

H. B. NAPIER. Estate Office, Long Ashton, Bristol.

Hon. Secretary :

W. J. GRANT. County Council Offices, Pentonville, Newport, Mon

REPORT BY THE GOVERNORS.

1. The Governors beg to submit to the Members the following Report on the work of the Institute during the past year.

2. The Institute has been founded and is maintained by the following Bodies :—

The Board of Agriculture and Fisheries.

The Bath and West and Southern Counties Society.

Devon County Council.

Gloucester County Council.

Herefordshire County Council.

Monmouthshire County Council.

Somerset County Council.

Worcestershire County Council.

3. Since the formation of the Institute, new Members and Associates have been enrolled each year, and the Governors hope that as the work and objects of the Institute become more widely known there will be a steady increase in the number of both Members and Associates.

4. In accordance with Article 30 of the Articles of Association, the following Governors retire :—

Governor.	By whom nominated.
BIFFEN, R. H. . . .	University of Cambridge.
DAVIS, H. J. . . .	Somerset County Council.
GIBBONS, H. H. . . .	Members and Associates.
GRENVILLE, R. NEVILLE . . .	Board of Agriculture and Fisheries.
OSBOURNE, J. S. SMYTH . . .	Governors.
RILEY, JOHN	Governors.
SHELLEY, SIR JOHN	Governors.
SLATTER, JAMES	Worcestershire County Council.
SMITH, J. W.	Herefordshire County Council
WATTS, JAMES	Members and Associates.

These Governors are eligible for re-nomination by the various Bodies whom they represent.

5. The Governors and Managing Committee wish to impress upon the Counties concerned, and upon all persons interested in the important industry of Cider-making the advantages of the opportunity now placed at their disposal, through the formation of the Institute, by means of which

Members and
Associates.

Advantages of
Institute.

they may obtain advice and assistance bearing upon this industry, either by personally visiting the Institute, or by sending their sons there to receive instruction, scientific and practical, not only in Cider and Perry-making, but also in the growth of fruit and the production of fruit trees.

6. Students can be received on the following terms :--

Terms.

Scientific instruction in the Laboratory :

Four guineas for one month's instruction ; or

Ten guineas for three months' instruction.

Working pupils from subscribing Counties can be received at the Institute for a period of not less than one year for instruction upon Fruit-growing, and to work upon the Farm. Pupils to receive a wage of 7s. 6d. per week from the Institute, the Counties sending the pupils to contribute a Scholarship of £20 per annum.

7. In October and November, 1906, the Cider-making months, a large number of all those interested in the West country industry of Cider-making from the Counties of Devon, Gloucester, Hereford, Monmouth, Somerset, and Worcester availed themselves of the opportunity of visiting the Institute. Practical Work.

8. Since the last report the Institute has been inspected by those who are interested both in the Cider industry and Fruit Culture from many Counties, all of whom seemed to be thoroughly impressed with the very practical and thorough manner in which the making of Cider was carried out, and also in the production of the best Cider Apples and Perry Pears, which are being grown in the Nursery attached to the Institute for the purposes of being eventually distributed in the Counties that support the Institute. Inspection of Institute, Nursery and Fruit Plantation.

9. A large and thoroughly representative gathering from each of the Counties already named responded to the invitation issued to be present at the Institute on Thursday, April 11th, 1907, for the purpose of both seeing the work that was being done, and tasting the Perry and Cider made from fruit grown in the above Counties. Mr. Barker, the Director, after the tasting, gave to an interested audience, an object lesson of considerable value on the various yeasts that are desirable or otherwise in the successful fermentation of Cider or Perry, this being original research work to which Mr. Barker has given special attention. Tasting Cider and Perry.

Object Lesson. 10. With a view of extending the usefulness of the Institute, arrangements were made by which exhibits from an educational standpoint were sent to

Bath and West and Southern Counties Society, Swindon.
 Berkeley Hunt Agricultural Society's Show.
 Brewer's Exhibition, London.
 Devon County Show.
 Hereford and Worcester Agricultural Society's Show.
 Mid-Somerset Agricultural Society's Show.
 Somerset County Agricultural Society's Show.
 Royal Agricultural Society's Show.

Adulteration
of Cider.

11. The Managing Committee have, since the last General Meeting, given considerable attention to the adulteration of Cider, and the use of preservatives in the same. With the view of investigating as far as possible the amount of harm that was being done to the Cider industry either by adding preservatives or "faking" Cider with inferior spirits or Saccharine, the authorities in each of the Cider-making Counties have again been communicated with in the matter, and also the authorities of the large towns where Cider is dealt with to any extent. In consequence of the interest thus aroused the Earl of Carrington, President of the Board of Agriculture and Fisheries, received a deputation, introduced by Sir C. T. Dyke-Acland, Bart. (Chairman of the Governors), on the 6th May, 1907, this deputation representing the unanimous views of the Cider-making Counties, including Cornwall, Norfolk, and the County Armagh (Ireland). The President of the Board of Agriculture and Fisheries expressed his entire sympathy with the movement, and promised to make use of the information now in the possession of the Board for the purpose of taking a test case before the Courts, and that if the law was not already sufficiently strong that it should be made so.

Railway Rates
for Cider Fruit.

12. The Managing Committee are giving considerable attention to the complaints sent to them from each of the Cider-making Counties as to the excessively high rates charged by railway companies for the carriage of Cider Apples and Perry Pears. An interview between representatives of the National Association of Cider Makers and Railway Companies, at which the Hon. Secretary was present, took place at the Board of Trade, on Friday, 6th March, last. Although no definite promise could be obtained from the Railway Companies it is hoped that concessions will yet be made.

13. The Governors take this opportunity of requesting all who are either interested in the Institute, or in the work it is doing, to use their influence in urging others to become Members. Members' subscriptions are one guinea per annum, for which they receive all the literature published by the Institute, and can have either six varieties of Apples or Pears, or six kinds of Cider or Perry analysed each year. Associates have the same privileges, with the exception that they are unable to vote at the Annual Meeting; while both Members and Associates can visit the Institute and obtain advice from Mr. B. T. P. Barker, upon all matters in connection with the Cider industry.

14. It is with sorrow and deep regret that the Governors have to record their great loss through the death of Mr. F. G. Farwell, a Governor, and Chairman of the Managing Committee.

15. In the Appendix will be found a reprint from the last "Journal" of the Bath and West and Southern Counties Society, containing Reports upon the National Fruit and Cider Institute, from Messrs. B. T. P. Barker and J. Ettle.

W. J. GRANT,
Hon. Sec.

THE NATIONAL FRUIT

TREASURER'S CASH STATEMENT FOR THE

RECEIPTS.

				£	s.	d.	£	s.	d.
To GRANTS—									
Board of Agriculture	..	..	..	300	0	0			
Bath & West of England Society	..	..	..	100	0	0			
Devon County Council	..	..	..	100	0	0			
Gloucester County Council	..	..	..	100	0	0			
Hereford County Council	..	..	..	100	0	0			
Monmouth County Council	..	..	..	50	0	0			
Somerset County Council	..	..	..	100	0	0			
Worcester County Council	..	..	..	100	0	0			
							950	0	0
To AFFILIATION FEES—									
Mid-Somerset Agricultural Society	..	..	..	1	1	0			
Berkeley Hunt Agricultural Society	..	..	..	1	1	0			
North Somerset Agricultural Society	..	..	..	1	1	0			
Royal Jersey Agricultural Society	..	..	..	1	1	0			
Bristol University College	..	..	..	1	1	0			
Monmouth Chamber of Agriculture	..	..	..	1	1	0			
							6	6	0
To MEMBERS' SUBSCRIPTIONS—									
	..	..	..				47	5	0
To ASSOCIATES' SUBSCRIPTIONS—									
	..	..	..				4	0	0
To SALES—									
Cider	..	..	..	40	1	3			
Fruit	..	..	..	58	14	3			
Potatoes	..	..	..	3	3	0			
Bottles, &c.	..	..	..	1	10	2			
Miscellaneous	..	..	..	0	13	6			
Making Cider	..	..	..	0	7	0			
							104	9	2
To CHEVALLIER, J. B. (Pupil's Fee)									
	..	..	..				4	4	0
To BALANCE DUE TO BANKERS—									
	..	..	..				444	1	0
							£1,560	5	2

AND CIDER INSTITUTE.

YEAR ENDING DECEMBER 31st, 1906.

	£	s.	d.	£	s.	d.
By BALANCE FROM LAST ACCOUNT ..	---			365	19	2
By SCIENTIFIC STAFF AND EXPENSES—						
Directors Salaries	375	0	0			
Expenses	50	3	1			
				425	3	1
By LABORATORY FITTINGS AND APPARATUS—..				16	18	4
By RENTS, RATES, AND CAPITAL EXPENDITURE—						
Rent	76	12	0			
Rates, Taxes, and Insurance	15	15	7			
Repayment to Landlord	81	15	5			
Alterations and repairs	22	7	8			
				196	10	8
By MACHINERY, PLANT, TOOLS, &c.— ..				15	8	6
By NURSERY ACCOUNT—Wages	40	11	4			
Sundry accounts	6	5	11			
				46	17	3
By PLANTATIONS ACCOUNT—Wages	96	1	3			
Sundry accounts	51	5	4			
				147	6	7
By ORCHARDS ACCOUNT—Wages	29	5	9			
Sundry Accounts	10	5	4			
				39	11	1
By CIDER-MAKING ACCOUNT—Wages	53	12	8			
Apples, &c.	99	13	5			
				153	6	1
By MISCELLANEOUS ACCOUNT—						
Fruit Superintendent, Honorarium and Expenses ..	54	14	2			
Printing, Advertising and Stationery	29	8	11			
Secretarial Postages and Expenses	13	16	9			
Auditors (2 years), Accountant and Correspondents ..	26	14	0			
Bank Charges	7	2	0			
Sundry Wages and Bills	21	8	7			
				153	4	5
				£1,560	5	2

In accordance with the provisions of The Companies' Act, 1900, we certify that all our requirements as Auditors have been complied with, and in our opinion the above account is properly drawn up to exhibit a true and correct view of the Institute's affairs as shown by the Books.

(Signed) CURTIS JENKINS & CO.,
7th March, 1907. Chartered Accountants.

APPENDIX.

REPORTS BY B. T. P. BARKER, M.A., *Director,*
AND
J. ETTLE, F.R.H.S., *Superintendent of Fruit*
Department.

REPORT BY B. T. P. BARKER, M.A.

THE EXPERIMENTAL CIDER WORK.

The experimental work on cider and perry carried on during the season of 1905-6 has been mainly a continuation of investigations upon the special problems dealt with in the report published in the last volume of this "Journal." In addition to those subjects, experiments have been made also to determine the influence of various methods of cider-making upon the nature of the product. The work, as a whole, suffered considerably on account of the very small crop of cider fruit in most of the counties. Owing to this cause, it was found to be impossible to procure a quantity of many varieties which were particularly desired, large enough to be used on a practical scale. In certain cases, however, small quantities of these varieties were obtained. These were dealt with on a small scale in the laboratory.

CIDERS MADE FROM SINGLE VARIETIES.

The method adopted in making these Ciders was that described in last year's Report, unless otherwise stated. The characters of the ciders were briefly as follows:—

SHARP VARIETIES—(including those containing normally at least .45 per cent. of Malic Acid.)

Cap of Liberty (Somerset).—Analysis of fresh juice, December 6th, 1905: Specific gravity 1.059, solids 14.54 per cent., sugar 12.41 per cent., malic acid 1.00 per cent., tannin .202 per cent., extractives .928 per cent. Filtered February 3rd, 1906; specific gravity 1.032. Specific gravity in bottle, December 10th, 1906: 1.024. A sweet, sharp, full cider; flavour clean and pleasant. Very useful for blending.

Chiswell George (Monmouth).—Analysis of fresh juice, November 15th, 1905: Specific gravity 1.048, solids 12.02 per cent., sugar 10.44 per cent., malic acid .67 per cent., tannin .066 per cent., extractives .844 per cent. Filtered February 7th, 1906; specific gravity, 1.011. Specific gravity in bottle, December 10th, 1906: 1.007. A medium dry, rather sharp cider; flavour fair. Of some value for blending.

Frederick (Monmouth).—Analysis of fresh juice, November 15th, 1905 : Specific gravity 1.051. Solids 13.16 per cent., sugar 11.33 per cent., malic acid 1.10 per cent., tannin .052 per cent., extractives .678 per cent. Filtered January 6th, 1906 : specific gravity 1.018. Specific gravity in bottle, December 10th, 1906 : 1.012. A medium very sharp cider; flavour characteristic and fair. Useful for blending.

Kingston Black (Somerset).—Analysis of fresh juice, November 29th, 1906 : Specific gravity 1.064, solids 15.74 per cent., sugar 13.58 per cent., malic acid .61 per cent., tannin .152 per cent., extractives 1.398 per cent. Filtered February 3rd, 1906 : specific gravity 1.035. Specific gravity in bottle, December 10th, 1906 : 1.028. A sweet, slightly sharp, full cider; flavour pleasant and fruity, but not quite clean. The latter character has developed since bottling. A good variety either for use alone or for blending.

Ridgway (Devon).—Analysis of fresh juice, December 6th, 1905 : Specific gravity 1.046, solids 11.60 per cent., sugar 11.25 per cent., malic acid .80 per cent., tannin .110 per cent. Filtered February 6th, 1906 : specific gravity 1.010. Specific gravity in bottle, December 10th, 1906, 1.006. A medium dry, sharp cider; flavour clean, and not unpleasant. The sharpness has toned down considerably since bottling. A useful sharp variety for blending.

Yeovil Sour (Somerset).—Analysis of fresh juice, December 20th, 1905 : Specific gravity 1.052, solids 13.40 per cent., sugar 11.95 per cent., malic acid .54 per cent., tannin .170 per cent., extractives .740 per cent. Filtered February 5th, 1906 : specific gravity 1.026. Specific gravity in bottle, December 10th, 1906, 1.019. A sweet, slightly sharp cider: flavour moderate, and without much character. Moderately useful for blending.

SWEET VARIETIES —(Including those containing normally less than .45 per cent. Malic Acid, and .20 per cent. Tannin.)

Clusters (Devon) —Analysis of fresh juice, December 5th, 1905 : Specific gravity 1.051, solids 12.98 per cent., sugar 12.41 per cent., malic acid .21 per cent., tannin .190 per cent., extractives .170 per cent. Filtered February 5th, 1906 : specific gravity 1.014. Specific gravity in bottle, December 10th, 1906 : 1.010. A medium dry, slight bitter cider; flavour pleasant, but lacking somewhat in character. Fairly good alone, but more useful as a neutral for blending.

Farmer's Glory (Somerset).—Analysis of fresh juice, November 15th, 1905 : Specific gravity 1.048, solids 12.06 per cent., sugar 10.22 per cent., malic acid .30 per cent., tannin .126 per cent., extractives 1.414 per cent. Filtered February 2nd, 1906 : specific gravity 1.002. Specific gravity in bottle, December 10th, 1906 : .999. A very dry, featureless cider; flavour not pleasant, and lacking character. Inferior as a neutral for blending.

Northwood (Devon).—Analysis of fresh juice, December 5th, 1906 : Specific gravity 1.049, solids 11.86 per cent., sugar 10.74 per cent., malic acid .23 per cent., tannin .140 per cent., extractives .700 per cent. Filtered February 2nd, 1906 : specific gravity 1.004. Specific gravity in bottle, December 10th, 1906 : 1.000. Very similar in character to Farmer's Glory; a trifle more bitter.

Sweet Alford (Devon).—Analysis of fresh juice, November 27th, 1905 : Specific gravity 1.051, solids 13.02 per cent., sugar 11.79 per cent., malic acid .15 per cent., tannin .068 per cent., extractives .928 per cent. Filtered February 2nd, 1906 : specific gravity 1.021. Specific gravity in bottle, December 10th, 1906 : 1.017. A sweet, fruity cider, without much character; flavour pleasant. Good alone, and very useful for blending as a neutral.

Woodbine (Devon).—Analysis of fresh juice, November 29th, 1905 : Specific gravity 1.055, solids 13.76 per cent., sugar 12.30 per cent., malic acid .23

per cent., tannin .170 per cent., extractives 1.060 per cent. Filtered February 1st, 1906 : specific gravity 1.019. Specific gravity in bottle, December 10th, 1906 : 1.007. A medium dry characterless cider ; flavour pleasant, but not quite clean. Fair alone, and useful for blending as a neutral. Much nicer in early summer than later.

BITTER 'SWEET VARIETIES.—(Including those containing normally less than .45 per cent. Malic acid, and more than .20 per cent. Tannin.)

Ashton Early Red Jersey (Somerset).—Analysis of fresh juice, October 13th, 1905 : Specific gravity, 1.054, solids 13.22 per cent., sugar 11.60 per cent., malic acid .18 per cent., tannin .312 per cent., extractives 1.128 per cent. Filtered February 9th, 1906 : specific gravity 1.019. Specific gravity in bottle, December 10th, 1906 : 1.018. A fairly sweet bitter cider ; flavour pleasant but slightly fusty, accounted for by the fact that the fruit begins to fall from the trees in late August, and is subject to brown and black rot during storage. A useful bitter-sweet for blending, but its early falling from the trees before the bulk of the crop is ripe is a drawback. Also known as "Compton Bitter."

Ashton White (Somerset).—Analysis of fresh juice, October 13th, 1905 : Specific gravity, 1.055, solids 13.66 per cent., sugar 11.75 per cent., malic acid .21 per cent., tannin .462 per cent., extractives 1.238 per cent. Filtered February 8th, 1906 : specific gravity 1.028. Specific gravity in bottle, December 10th, 1906 : 1.025. A sweet bitter cider ; flavour pleasant and aromatic. Very useful as a bitter-sweet for blending, but subject to the same drawbacks as the preceding. This variety is an unknown one, grown in the old orchard at the Institute. It resembles White Norman in appearance and properties.

Belle Norman (Monmouth) —Analysis of fresh juice, November 6th, 1905 : Specific gravity 10.495, solids 12.84 per cent., sugar 11.06 per cent., malic acid .19 per cent., tannin .219 per cent., extractives 1.374 per cent. Filtered February 9th, 1906 : specific gravity 1.021. Specific gravity in bottle, December 10th, 1906 : 1.017. A medium sweet fruity cider, with a trace of bitterness ; flavour pleasant and very clean. Very useful as a mild bitter-sweet, and pleasant unblended, although a trifle lacking in acidity.

Chisel Jersey (Somerset).—Analysis of fresh juice, January 3rd, 1906 : Specific gravity 10.585, solids 15.32 per cent., sugar 15.08 per cent., malic acid .19 per cent., tannin .500 per cent. Filtered perfectly bright, January 4th, 1906, the day after pressing. It clouded again, and began to ferment about three weeks later ; but in April cleared again, and was racked quite bright. Specific gravity in bottle, December 10th, 1906 : 1.021. A sweet bitter and astringent cider ; flavour pleasant and characteristic with a full aftertaste. Very useful as a pronounced bitter-sweet for blending.

Cummy Norman (Hereford).—Analysis of fresh juice, December 6th, 1905 : Specific gravity 1.057, solids 15.06 per cent., sugar 14.40 per cent., malic acid .25 per cent., tannin .216 per cent., extractives .194 per cent. Filtered January 15th, 1906 : Specific gravity 1.018. Specific gravity in bottle, December 10th, 1906 : 1.007. A thin dry rather bitter cider ; flavour inferior. Second-rate for blending as a bitter-sweet.

Dabinet (Somerset).—Analysis of fresh juice, January 3rd, 1906 : Specific gravity 1.054, solids 14.34 per cent., sugar 13.94 per cent., malic acid .12 per cent., tannin .268 per cent., extractives .012 per cent. Filtered January 4th, 1906, the day after pressing. Cloudiness and fermentation set in after three weeks, and the liquid did not clear until July, when the specific gravity was reduced to 1.010. A full-flavoured dry bitter cider ; flavour characteristic but too pronounced. Useful for blending as a bitter-sweet.

Horners (Somerset).—Analysis of fresh juice, November 6th, 1906 : Specific gravity 1.0615, solids 15.66 per cent., sugar 14.46 per cent., malic acid .17 per cent., tannin .286 per cent., extractives .744 per cent. Filtered February 1st, 1906 : specific gravity 1.013. Specific gravity in bottle, December 10th, 1906 : 1.008. A strong dry bitter cider; flavour rather harsh. Useful in blending as a bitter-sweet.

Red Jersey (Somerset).—Analysis of fresh juice, December 5th, 1906 : Specific gravity 1.064, solids 15.48 per cent., sugar 14.40 per cent., malic acid .29 per cent., tannin .260 per cent., extractives .530 per cent. Filtered February 4th, 1906 : specific gravity 1.013. Specific gravity in bottle, December 10th, 1906 : 1.005. A dry, full, harsh, bitter cider; flavour strong and not pleasant. A second-rate bitter-sweet for blending.

White Jersey (Somerset) —Analysis of fresh juice, November 28th, 1905 : Specific gravity 1.051, solids 12.58 per cent., sugar 11.56 per cent., malic acid .19 per cent., tannin .202 per cent., extractives .628 per cent. Filtered February 6th, 1906 : specific gravity 1.005. Specific gravity in bottle December 10th, 1906 : 1.001. A thin, dry rather bitter cider; flavour not pleasant, and of no special character. Inferior for blending as a bitter-sweet.

White Norman (Hereford).—Analysis of fresh juice, November 28th, 1905 : Specific gravity 1.059, solids 15.02 per cent., sugar 13.20 per cent., malic acid .36 per cent., tannin .232 per cent., extractives .228 per cent. Filtered January 31st, 1906 : specific gravity 1.017. Specific gravity in bottle, December 10th, 1906 : 1.011. A medium dry, full, rather bitter cider: flavour moderate. Fairly useful for blending as a bitter-sweet. The fruit was received in bad condition; hence the comparatively high percentage of acidity, and probably also some loss of quality.

PERRY.

Oldfield (Lulley, Hereford).—Analysis of fresh juice, November 17th, 1905 : Specific gravity 1.060, solids 15.04 per cent., sugar 11.19 per cent., malic acid .61 per cent., tannin .066, extractives 3.164 per cent. Filtered February 8th, 1906 : specific gravity 1.017. Specific gravity in bottle, December 10th, 1906 : 1.015. A medium dry, rather sharp perry; flavour good, but rather thin.

Oldfield (Gloucester).—Analysis of fresh juice, December 1st, 1905 : Specific gravity 10.54, solids 13.54 per cent., sugar 12.00 per cent., malic acid .57 per cent., tannin .042 per cent., extractives .928 per cent. Filtered February 9th, 1906 : specific gravity 1.025. Specific gravity in bottle, December 10th, 1906 : 1.023. A sweet brisk, rather sharp perry; flavour pleasant. Very good.

Huffcap (Ladbury, Hereford).—Analysis of fresh juice, December 4th, 1905 : Specific gravity 1.069, solids 18.28 per cent., sugar 17.68 per cent., malic acid .38 per cent., tannin .066 per cent., extractives .174 per cent. Filtered February 8th, 1906 : specific gravity 1.029. Specific gravity in bottle, December 10th, 1906 : 1.027. A sweet, slightly bitter, perry; flavour pleasant and characteristic. Of good quality.

The following Ciders were made on a small scale in the laboratory. The juice in each case was fermented in glass bottles, about 1½ gallons in capacity, and racked at the completion of active fermentation, and again, once or more often, until the cider was bright. It was then bottled in ordinary pint bottles.

SHARP VARIETIES.

Fair Maid of Devon (Devon).—Analysis of fresh juice, December 7th, 1905 : Specific gravity 1.044, solids 10.00 per cent., sugar 9.60 per cent., malic acid .66 per cent., tannin .040 per cent., Specific gravity in bottle, December 17th, 1906 : 1.011. A thin, dry, sharp cider; flavour characteristic, and not altogether pleasant. Inferior for blending.

Foxwhelp (Hereford).—Analysis of fresh juice, December 13th, 1905 : Specific gravity 1.057, solids 14.22 per cent., sugar 12.26 per cent., malic acid 1.07 per cent., tannin .196 per cent., extractives .696 per cent. Specific gravity in bottle, December 17th, 1906 : 1.010. A dry very sharp cider, with characteristic flavour. Condition brilliant, too sharp unblended for most palates, but useful for blending.

Kingston Black (Devon).—Analysis of fresh juice, December 19th, 1905 : Specific gravity 1.064, solids 15.52 per cent., sugar 14.60 per cent., malic acid .61 per cent., tannin .09 per cent., extractives .220 per cent. Specific gravity in bottle, December 17th, 1906 : 1.014. A medium cider; flavour pleasant; condition brilliant. Good alone or blended.

Kingston Black (Hereford).—Analysis of fresh juice, December 19th, 1905 : Specific gravity 1.058, solids 15.16 per cent., sugar 13.53 per cent., malic acid .49 per cent., tannin .080 per cent., extractives 1.060 per cent. Specific gravity in bottle, December 17th, 1906 : 1.020. A sweet moderately full cider of medium character; flavour pleasant. Good alone or blended.

Neverblight (Somerset).—Analysis of fresh juice, December 13th, 1905 : Specific gravity 1.049, solids 12.26 per cent., sugar 10.95 per cent., malic acid .50 per cent., tannin .090 per cent., extractives .720 per cent. Specific gravity in bottle, December 17th, 1906 : 1.003. A thin, poor, rather sharp cider; flavour unpleasant; condition fairly bright. Inferior for blending.

Red Foxwhelp (Hereford).—Analysis of fresh juice, December 13th, 1905 : Specific gravity 1.048, solids 11.76 per cent., sugar 10.69 per cent., malic acid .73 per cent., tannin .064 per cent., extractives .271 per cent. Specific gravity in bottle, December 17th, 1906 : 1.023. A sweet, rather thin sharp cider; flavour pleasant clean and characteristic; condition brilliant. Useful for blending; rather too sharp alone.

Rouge de Treves (Somerset).—Analysis of fresh juice, December 19th, 1905 : Specific gravity 1.052, solids 12.52 per cent., sugar 11.64 per cent., malic acid 1.03 per cent., tannin .086 per cent. Specific gravity in bottle, December 17th, 1906 : 1.007. A very sharp dry cider; flavour characteristic and fairly full; condition brilliant. Moderately useful for blending.

Tom Putt (Devon).—Analysis of fresh juice, December 19th, 1905 : Specific gravity 1.049, solids 11.93 per cent., sugar 10.95 per cent., malic acid .63 per cent., tannin .102 per cent., extractives .298 per cent. Specific gravity in bottle, December 17th, 1906 : 1.004. A sharp dry cider; flavour pleasant and clean. Useful for blending.

SWEET VARIETIES.

Ansell (Somerset).—Analysis of fresh juice, December 13th, 1905 : Specific gravity 1.067, solids 16.98 per cent., sugar 15.86 per cent., malic acid .22 per cent., tannin .122 per cent., extractives .778 per cent. Specific gravity in bottle, December 17th, 1906 : 1.015. A medium sweet, slightly bitter cider; flavour pleasant, clean and strong; condition not quite brilliant. Fair alone and useful for blending.

Brown Jersey (Somerset).—Analysis of fresh juice, December 19th, 1905 : Specific gravity 1.054, solids 13.88 per cent., sugar 12.77 per cent., malic acid .17 per cent., tannin .096 per cent., extractives .844 per cent. Specific gravity

in bottle, December 17th, 1906 : 1.002. A dry harsh, bitter cider ; flavour unpleasant ; condition cloudy. Poor and not of much value for blending.

Douce Amere (Somerset).—Analysis of fresh juice, December 19th, 1905 : Specific gravity 1.057, solids 14.44 per cent., sugar 13.33 per cent., malic acid .31 per cent., tannin .130 per cent., extractives .670 per cent. Specific gravity in bottle, December 17th, 1906 : 1.006. A dry, rather bitter cider ; flavour fairly full, but not pleasant ; condition almost brilliant. Inferior alone or for blending.

BITTER-SWEET VARIETIES.

Cherry Norman (Hereford).—Analysis of fresh juice, December 7th, 1905 : Specific gravity 1.045, solids 12.18 per cent., sugar 11.36 per cent., malic acid .21 per cent., tannin .220 per cent., extractives .390 per cent. Specific gravity in bottle, December 17th, 1906 : 1.009. A dry, mild bitter cider ; fusty ; condition cloudy. The sample of fruit was in bad condition.

Cherry Norman (Worcester).—Analysis of fresh juice, December 13th, 1905 : Specific gravity 1.055, solids 15.32 per cent., sugar 12.10 per cent., malic acid .28 per cent., tannin .198 per cent., extractives 1.402 per cent. Specific gravity in bottle, December 17th, 1906 : 1.023. A sweet mild bitter cider ; flavour very fair ; condition cloudy. Fair alone, but better blended.

Chisel Jersey (Somerset).—Analysis of fresh juice, December 13th, 1905 : Specific gravity 1.053, solids 13.86 per cent., sugar 12.43 per cent., malic acid .19 per cent., tannin .210 per cent., extractives 1.030 per cent. Specific gravity in bottle, December 17th, 1906 : 1.019. A sweet, slightly bitter cider ; flavour pleasant ; condition cloudy. Useful for blending.

Knotted Kernel (Hereford).—Analysis of fresh juice, December 19th, 1905 : Specific gravity 1.061, solids 15.94 per cent., sugar 14.60 per cent., malic acid .18 per cent., tannin .220 per cent., extractives .940 per cent. Specific gravity in bottle, December 17th, 1906 : 1.016. A medium sweet, full, bitter cider ; flavour pleasant ; condition nearly brilliant. Useful for blending.

Masters Jersey (Somerset).—Analysis of fresh juice, December 19th, 1905 : Specific gravity 1.058, solids 15.70 per cent., sugar 14.15 per cent., malic acid .18 per cent., tannin .200 per cent., extractives 1.170 per cent. Specific gravity in bottle, December 17th, 1906 : 1.025. A sweet slightly bitter cider ; flavour fair ; condition not quite brilliant. Useful for blending.

Medaille d'Or (Somerset).—Analysis of fresh juice, December 13th, 1905 : Specific gravity 1.079, solids 20.08 per cent., sugar 18.77 per cent., malic acid .30 per cent., tannin .600 per cent., extractives .410 per cent. Specific gravity in bottle, December 17th, 1906 : 1.049. A very sweet and extremely bitter cider ; flavour pleasant, although too pronounced ; condition not quite brilliant. Useful in small quantities for blending, but too bitter to form any considerable proportion of a blend.

Royal Jersey (Somerset).—Analysis of fresh juice, December 19th, 1905 : Specific gravity 1.067, solids 16.96 per cent., sugar 15.08 per cent., malic acid .20 per cent., tannin .158 per cent., extractives 1.522 per cent. Specific gravity in bottle, December 17th, 1906 : 1.024. A sweet, full, mild bitter cider ; flavour pleasant and fruity ; condition not quite brilliant. Very useful for blending.

Silver Cup (C. Osborn, Woolston, Somerset).—Analysis of fresh juice, December 19th, 1905 : Specific gravity 1.066, solids 16.70 per cent., sugar 14.84 per cent., malic acid .18 per cent., tannin .350 per cent., extractives 1.330 per cent. Specific gravity in bottle, December 19th, 1906 : 1.026. A sweet, full, rather bitter cider ; flavour pleasant ; condition almost brilliant. Very useful for blending.

Silver Cup (H. J. Davis, Sutton Montis, Somerset).—Analysis of fresh juice,

December 19th, 1905 : Specific gravity 1.071, solids 18.62 per cent., sugar 15.86 per cent., malic acid .20 per cent., tannin .264 per cent., extractives 2.296 per cent. Specific gravity in bottle, December 17th, 1906 : 1.009. A dry, bitter cider ; flavour poor and unsound ; condition not quite brilliant. The fruit was in a bad condition, when ground.

Special Silver Cup (Somerset).—Analysis of fresh juice, December 19th, 1905 : Specific gravity 1.066, solids 16.84 per cent., sugar 15.08 per cent., malic acid .23 per cent., tannin .248 per cent., extractives 1.282 per cent. Specific gravity in bottle, December 17th, 1906 : 1.011. A strong, slightly sweet, rather bitter cider ; flavour very fair ; condition cloudy. Useful for blending.

Strawberry Norman (Hereford).—Analysis of fresh juice, December 19th, 1906 : Specific gravity 1.051, solids, 12.78 per cent., sugar 11.79 per cent., malic acid .16 per cent., tannin .270 per cent., extractives .560 per cent. Specific gravity in bottle, December 17th, 1906 : 1.013. A medium sweet, rather bitter cider ; flavour fair ; condition clear. A fairly useful bitter-sweet for blending.

Strawberry Norman (Worcester).—Analysis of fresh juice, December 19th, 1905 : Specific gravity 1.060, solids 14.64 per cent., sugar 13.62 per cent., malic acid .25 per cent., tannin .168 per cent., extractives .602 per cent. Specific gravity in bottle, December 17th, 1906 : 1.035. A very sweet, mildly bitter cider ; flavour pleasant, fruity and full ; condition nearly brilliant. Useful alone or blended.

White Norman (Hereford).—Analysis of fresh juice, December 7th, 1905 : Specific gravity 1.056, solids 14.76 per cent., sugar 13.84 per cent., malic acid .19 per cent., tannin .260 per cent., extractives .470 per cent. Specific gravity in bottle, December 17th, 1906 : 1.032. A sweet, full, bitter cider ; flavour rich and pleasant ; condition cloudy. Very useful for blending.

Yarlington Mill (Somerset).—Analysis of fresh juice, December 19th, 1905 : Specific gravity 1.049, solids 13.00 per cent., sugar 11.95 per cent., malic acid .20 per cent., tannin .198 per cent., extractives .652 per cent. Specific gravity in bottle, December 17th, 1906 : 1.005. A dry, slightly bitter cider ; flavour moderate ; condition cloudy. Fruit in poor condition at the time of grinding. Second-rate for blending.

It is clear from the results given by the experiments on single-variety ciders, both in the cider-house and the laboratory, that the remarks made in the last Report as to the characters which are valuable for vintage purposes are fully confirmed. They may be summed up briefly as follows :—The characteristic flavour of the variety and the rate of fermentation of the juice are the two characters of primary importance as regards the quality of the cider ; the percentages of malic acid and tannin in the juice determine the suitability of the variety for use alone or for blending ; and the composition of the juice from most varieties is such that it can rarely yield a palatable cider unblended, containing usually either too much malic acid or tannin. To these it may be added that the higher the specific gravity of the fresh juice the more useful is the variety, supposing the other characters to be equal. This is not only due to the fact that a larger percentage of sugar is thus obtained

and that, therefore, the equivalent of a higher percentage of alcohol exists,—a factor of importance with regard to the keeping qualities of cider,—but also because, with the higher specific gravity, a longer period of time is required for fermentation to a definite point, so that the cider itself does not need so much attention during the current period of actual cider-making. On the other hand, a high specific gravity does not suffice to make valuable a variety, the other characters of which are inferior.

Having thus indicated the most important vintage characters, we may now consider the means of utilising them to the best advantage with the fruit at the disposal of the maker.

In the first place, it must be stated that the indiscriminate mixture of different varieties and of fruit at various stages of ripeness, according to the usual practice at the time of gathering the fruit, is most unsatisfactory. In some instances no doubt the results may be all that can be desired. Such are due to the fact that the mixture happens to contain the fruit of the three different classes—sours, sweets, and bitter-sweets,—in suitable proportions, possibly simply by chance or possibly because the orchards yielded naturally crops of these classes, ripening at the same time in suitably balanced qualities, owing to the relative numbers of the trees of each type. Generally, however, it is manifest that the mixture is not of a nature which will allow the fruit contained in it to be used to the best advantage, since the chances are that either sharp or bitter-sweet apples predominate unduly and that inferior and superior varieties are mixed. In any case, this natural and crude method of blending is entirely one over which the maker has no control and the success of which depends entirely on chance factors.

The quality of a cider must always depend primarily on the quality of the fresh juice. This being so, the first essential is to sort or grade the different kinds of fruit at the disposal of the maker, so that a juice of the desired standard can be obtained. If, for example, a sweet cider is required, having a specific gravity of about 1.030, it is advisable to start with a juice containing about .4-.6 per malic acid and .15-.25 per cent. tannin. (The quantities of these substances must depend upon individual taste. The amounts quoted are given to furnish an example to illustrate the general method of procedure rather than to denote an arbitrary standard: but they represent in practice a proportion which is, perhaps, most popular). To obtain a juice of this nature two factors must be considered: (a) The juice must not possess the property of rapid fermentation, as otherwise it would be difficult to keep the specific gravity from falling below 1.030 by natural means, and (b) the fruit

must be selected, so that the required proportions of acid and tannin are present. The first point is achieved by the use of varieties, which yield juices of this character, and also by using ripe fruit only. (This subject is dealt with in greater detail under the heading Rate of Fermentation.) The second point is met most simply by using one variety only, the juice of which possesses a composition within the stated limits. A variety of this type is Kingston Black. It is, however, exceptional to deal in bulk with fruit only of this class, so that the same result must be arrived at by blending two or more sorts in suitable proportions.

Considering, for example, some of the single variety ciders made last season, the fresh juices of Cap of Liberty and Cherry Norman could be blended in equal quantities to give the correct proportions, the amount of malic acid in Cap of Liberty being 1.00 per cent. and in Cherry Norman .21 per cent., and of tannin .202 per cent. in Cap of Liberty, and .220 per cent. in Cherry Norman. Thus—

		Malic Acid.	Tannin.
100 parts of Cap of Liberty contain ..	1.00	.202	
100 parts of Cherry Norman ..	.21	.220	
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200 parts of the Blend ..	1.21	.422	
i.e., 100 parts ..	.60	.21	

While the foregoing serves as an example of the blending of a mild bitter-sweet and a sour, the following shows how a similar result can be obtained, using varieties of each of the three types—sour, sweet, and bitter-sweet.

		Malic Acid.	Tannin.
200 parts of Frederick (acid 1.10%, tannin .052 %)	contain 2.20	.104	
200 parts of Sweet Alford (acid .15 % tannin .068 %)	..	.30	.136
100 parts of Medaille d'Or (acid .30 % tannin .600 %)	..	.30	.600
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500 parts of Blend ..	2.80	.840	
i.e., 100 parts of Blend ..	.56	.17	

The same results could be obtained approximately by mixing corresponding weights of each variety instead of blending the fresh juices. The composition of such mixtures would, however, vary slightly, since some varieties yield a greater quantity of juice than others.

Similar methods would be pursued to obtain a medium cider with a specific gravity of 1.015. In this case, however, it would be found that the proportions of malic acid and tannin, which hold good for the sweet cider with a specific gravity of 1.030, are not suitable but would require to be altered to, say, .25-.45 per cent. malic acid, and .10-.20 per cent. tannin. The reason why a lower proportion of these substances is required to give the same effect in this instance is that the amount of unfermented sugar in this cider

(sp. gr. 1.015), is less than that in the sweet cider (sp. gr. 1.030), and that, consequently, there is less sweetness to mask the acidity of the malic acid and the bitterness of the tannin than in the preceding case. Accordingly, smaller proportions of malic acid and tannin are required to produce the same apparent degree of acidity and bitterness or, in other words, the same balance of flavour. For the same reason, if a dry cider with a specific gravity of 1.005 is required, the proportions of malic acid and tannin will need to be reduced again to .15-.35 per cent. and .05-.15 per cent. respectively. Considering illustrations of blends for medium and dry ciders in the same way as those given earlier for sweet ciders, it will be noticed that a satisfactory blend of Cap of Liberty and Cherry Norman cannot be constructed for either of these types, since the tannin proportion is invariably too high. Thus :—

		Malic Acid.	Tannin.
100 parts of Cap of Liberty contain	1.00	.202
400 parts of Cherry Norman84	.880
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500 parts of Blend	1.84	1.082
i.e. 100 parts of Blend37	.216

The following, however, gives the desired result for a medium cider :—

		Malic Acid.	Tannin.
100 parts of Frederick contain	1.10	.052
400 parts of Sweet Alford60	.272
100 parts of Medaille d'Or30	.600
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600 parts of Blend	2.00	.924
i.e., 100 parts of Blend33	.154

and for a dry cider :—

100 parts of Frederick contain	1.10	.052
600 parts of Sweet Alford90	.408
100 parts of Medaille d'Or30	.600
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800 parts of Blend	2.30	1.060
i.e., 100 parts of Blend29	.132

It will be noticed that these blends are brought within the required limits of acid and tannin contents solely by means of the use of a large proportion of Sweet Alford juice. This apple is a good type of the class of “ sweets,” the juices of which are characterised by the very low percentages of acid and tannin. The importance of this class can be seen from the above examples, which show that the drier the cider required, the greater must be the proportion of “ sweets,” in order that the degrees of acidity and bitterness should not be too pronounced. “ Bitter-sweets ” and “ sours,” if blended

without the inclusion of some "sweets," rarely yield a juice which does not contain quantities of tannin and malic acid too large to be suitable for the production of a dry cider. Given a sufficient quantity of "sweets," it is possible to construct a blend suitable for any type of cider. It is somewhat curious that more attention has not been paid to this class of fruit, for nearly all the most noted cider varieties belong either to the "bitter-sweet" or "sour" class. Probably this is due to the fact that the "sweets" play an apparently inconspicuous part in any blend, toning down and neutralising the pronounced characters of the fruit belonging to the other classes, while if used alone they produce a cider more or less devoid of any special character. Particular attention is being paid to varieties of this class during the current season's work.

The experimental work, in connection with the construction of blends from single variety ciders, has shown the necessity of having equivalent quantities of fruit of the three classes at command, if the best possible results are to be obtained and ciders of a regular quality and standard to be produced. Equivalent quantities do not imply equal quantities, but rather amounts of each class in proportions which, when blended, yield a juice containing suitable percentages of malic acid and tannin. It is frequently owing rather to the disproportion between these classes which exists in some localities than to any deficiency in soil that those places are regarded as inferior cider districts, although the soil is always of great importance. But the point which it is desired to emphasize here is that it is impossible to make palatable cider from some orchards—or even in some districts—if the fruit is mixed indiscriminately, a result not due to the unsuitability of the soil, but owing to the fruit of one or two classes being grown in overwhelming proportion. As an example the old orchard at the Institute may be instanced. The average composition of the juice obtained during any one season from fruit grown there is characterised by a very high percentage of acidity (about .75–1.00 per cent. malic acid); while the specific gravity usually does not average higher than 1.052, and the rate of fermentation is very rapid. The flavour of the fresh juice is thus, even before fermentation, too sharp for most palates and, of course, soon becomes relatively much sharper still, owing to the rapid loss of sugar during fermentation. It is very quickly converted into a very sharp, thin, dry cider. A large proportion of sweets and bitter-sweets would be required to make this cider satisfactory, since far too many of the trees in this orchard belong to sour varieties. To make good cider from this place it is necessary to keep the comparatively few "sweets" and "bitter-sweets" which are present

separate from the "sours," when the fruit is gathered. They can then be made up separately and the juice from them blended with a suitable proportion of the juice from the "sours" after pressing: or they can be mixed with a corresponding quantity of sour fruit before grinding. By this means it is possible to obtain fresh juice with .50 per cent. malic acid, or less, so that the mature cider, even though its specific gravity may eventually fall to less than 1.020, is not too unpleasantly sharp. It is true that the acidity of the cider made from the surplus sour apples is rather more pronounced by dividing the fruit in this manner; but the extra acidity is comparatively insignificant and unimportant, since, even if the whole of the fruit is mixed, the cider is certain to be much too sharp. The total value of the cider as a whole is greater if dealt with thus.

It may be remarked, while dealing with this subject, that it is advisable to store for several months ciders which are originally too sharp: since the acidity slowly diminishes, if air is kept absolutely excluded. Thus the cider from Ridgway apples was, last spring, far too sharp to be pleasant, but, at the present time, although still on the sharp side, is not at all unpalatable, having mellowed considerably and diminished in acidity during the summer.

These facts should be taken into consideration when it is proposed to plant fresh cider orchards, or to replace trees in old orchards. It is clear that pleasant cider cannot be made unless the different classes of fruit are available in suitable proportions, and that this depends in the end on the proportions in which the trees of the different classes are grown. While in some districts it may be advisable to plant largely trees of one or other of these classes in order to remedy present deficiencies, it should not be overlooked that, in course of time, as the older trees of the other types wear out, these younger trees will in their turn constitute the predominating class. In the interests of cider-making of the future, it is most desirable that a selection of varieties of the different types should be made in a definite ratio, not necessarily a perfectly rigid one, when fresh orchards are planted.

THE RATE OF FERMENTATION.

It was mentioned in the last report that the causes for the considerable variations in the rate of fermentation and in the extent to which fermentation was carried in different ciders, were being investigated. As an example of such variations, the cases of the Cummy Norman and Cap of Liberty ciders may be quoted. Both lots of apples were pressed in the same day, and afterwards the

juices were kept under similar conditions. The specific gravities of the fresh juices were respectively 1.057 and 1.059. Six weeks later the specific gravity of the former was 1.018, and of the latter 1.040. The explanation of these variations may now be given as follows :— Different juices contain different quantities of nitrogenous substances, suitable for the nutrition of the yeasts, the larger the quantity the better being the nutrition of the yeasts, and consequently the more rapid the fermentation. Other factors also influence the rate of fermentation ; but the determining factor of the rate of fermentation of different juices kept under similar conditions is the quantity of these nitrogenous substances, the influence of the other factors being comparatively inappreciable. From the experience of observations continued over three seasons, it may be stated that normally the juices from certain varieties are rich in nitrogenous yeast food, *i.e.*, they ferment rapidly, while those from other varieties are poor, *i.e.*, they ferment slowly. At the same time, juices from the same variety grown in different localities do not always ferment at approximately the same rate, although the tendency seems to be towards a more or less general agreement. While the soil and other factors of situation may, and doubtless do, have some influence, it seems improbable that they are responsible for any considerable variation : for in many orchards trees growing side by side produce fruit yielding juices with very different rates of fermentation. The degree of ripeness of the fruit at the time of grinding has a very important influence upon the amount of nitrogenous yeast food in the juice. Up to a certain point of ripeness the quantity diminishes as the fruit ripens, but beyond this point it increases again. Therefore the juice from unripe fruit ferments more quickly than that from over-ripe fruit, and the latter more quickly than that from ripe fruit. Another factor of importance is the extent to which the fruit has been exposed to the sun. The juice from well-coloured fruit taken from the sunny side of the tree ferments more slowly than that from less well-coloured fruit taken from the shady side, and this holds good after making due allowance for any differences in the degree of ripeness.

Since, then, the rate at which a juice will ferment depends primarily on the variety of the fruit, its condition as regards ripeness, and the extent to which it has been exposed to the sun, it follows that, in order to obtain a slow, steady fermentation, it is essential that any varieties which give rapidly fermenting juices should be excluded, that the fruit itself should be as nearly as possible of the same degree of ripeness, and not made up until fully ripe, and that the fruit should be exposed to the sun as much as possible.

PRACTICAL METHODS.

Apart from the work dealing with the characters of the different varieties, the question of blending, and the control of fermentation by the use of special yeasts, a few experiments have been made to determine how far the character of the product is affected by the method of making and the management of the juice during fermentation. Two points were dealt with more particularly last season, viz., the relative advantages and disadvantages of keeving and not keeving the juices, and also of macerating the pomace, *i.e.*, of allowing it to stand for 24 hours after grinding before pressing, as against pressing immediately after grinding.

KEEVING.—The advantages of keeving appear to be the facility with which suspended solid matter in the juice can be removed and also, as a consequence, the possibility of reducing the sediment in the fermenting casks and, thus, of keeping them clean more easily. Against these points must be set the tendency of the juice in keeve to acetify slightly on account of the comparatively large surface exposed to air, although, as a rule, this effect is practically unnoticeable; and also a more important point, viz.:—that fermentation sets in more rapidly, as a rule, when the juice is keeved than when it is placed at once in the fermenting cask. The probable reason of this feature is the stimulating effect of the air on the yeasts, the juice in keeve being exposed to this influence much more than that in cask. Thus, the juice from Oldfield pears, when keeved, dropped in specific gravity from 1.070 to 1.062, while the same juice in cask, in the same period of time, dropped only from 1.070 to 1.069; and similarly the keeved juice of Cummy Norman apples dropped from 1.058 to 1.039 as against a fall from 1.058 to 1.049 in the case of the same juice unkeeved, during the same period. While this is not a necessarily disadvantage of keeving, if it is intended to make a dry cider, it becomes so if a sweet cider is to be made, since it means practically that a keeved cider must be filtered or otherwise cleared for storage at least a week (and in many cases a much longer period) earlier than the other, if the same result is to be obtained in each case. It tends thus to cause the period for cellar work to encroach on that occupied by the actual operations of making and, when it is not possible to spare time or labour for both, it results in the general average specific gravity of the ciders being several points lower than it would have been if the juice had not been keeved originally. Further experiments which have been in progress during the present season fully confirm these results of last season's work. Taking all points into consideration, the practice of keeving does not appear to be so useful

as the method of placing the juice direct into the fermenting cask, unless there is a large quantity of suspended matter to be removed, or a likelihood of a thick brown head being formed.

MACERATION.—With regard to the question of the maceration of the pomace, there is a widespread idea that a richer juice is obtained after the pomace is allowed to stand for 24 hours before pressing than when pressed immediately. The results of experiments carried out during the past two seasons show that the juice from macerated pomace has generally a slightly higher specific gravity than that from unmacerated pomace, but that this difference, in itself, is not sufficient to compensate for the extra labour involved. There are, however, other points in favour of maceration which render that method profitable, if the resources of the maker allow of its adoption without much extra labour and trouble. (With some makers it is doubtless quite as convenient as the system of immediate pressing). The juice generally is more easily expressed; the total yield is in many cases appreciably larger; the cider tends to clear itself more easily; and the flavour of the resulting cider is (according to the few tests already completed) somewhat fuller and softer. The following results illustrate these points:—

		Pomace Pressed Immediately.	Pomace Macerated 24 Hours.
CHERRY NORMAN—			
Weight of pomace	.. ..	1,275 lbs.	1,300 lbs.
Weight of juice after first pressing		857 lbs.	970 lbs.
Ditto, after second pressing	.. ..	94 lbs.	91 lbs.
Specific gravity of juice	.. ..	10.549	10.560
Malic Acid in juice	.. ..	.14 per cent.	.14 per cent.
Tannin in juice	.. ..	.352 per cent.	.316 per cent.

WHITE NORMAN—

Weight of pomace	.. ..	1,100 lbs.	1,100 lbs.
Weight of juice after first pressing		757 lbs.	700 lbs.
Ditto, after second pressing	.. ..	81 lbs.	140 lbs.
Specific gravity of juice	.. ..	10.537	10.545
Malic Acid in juice	.. ..	.14 per cent.	.13 per cent.
Tannin in juice	.. ..	.300 per cent.	.226 per cent.

SWEET ALFORD—

Weight of pomace	.. ..	950 lbs.	950 lbs.
Weight of juice after first pressing		595 lbs.	612 lbs.
Ditto, after second pressing	.. ..	60 lbs.	108 lbs.
Specific gravity of juice	.. ..	10.593	10.614
Malic Acid in juice	.. ..	.15 per cent.	.13 per cent.
Tannin in juice	.. ..	.134 per cent.	.148 per cent.

In the cases of Cherry Norman and Sweet Alford, there is a decided increase in the total yield of juice from the macerated pomace and also a larger yield in the first pressing, showing that maceration tends to aid the expression of the juice. In each instance the specific gravity is slightly higher also, a result probably due as much to slight evaporation of moisture from the exposed pomace—as to any actual increase in saccharine matter brought about by chemical action in the pulp. The acidity is practically unchanged, but there is decidedly less tannin in the juice from the macerated pomace of the two bitter-sweet varieties, Cherry and White Norman, the amount in the case of Sweet Alford being practically unaltered. The smaller content of tannin may partly account for the extra softness of macerated cider; and, possibly, this effect may also be due to a larger percentage of mucilaginous substances.

FILTRATION.—The effect of filtering in the later stages of fermentation is well-known, fermentation invariably being checked for a time and frequently almost entirely stopped. Experiments were made last season to determine its influence on the course of fermentation by subjecting the fresh juice to filtration as it came from the press. Two varieties, Chisel Jersey and Dabinet, were tested in this manner. It was found possible to obtain the juice in a perfectly brilliant condition by passing it through the filter, although the rate of filtration was naturally slower than that of a fermented cider. Check samples of the fresh unfiltered juice of each kind were kept side by side with the filtered liquids. The behaviour of the ciders in the two tests varied considerably. In each case, the liquid became cloudy after an interval of three weeks, and fermentation set in; but, whereas in the Chisel Jersey juice, fermentation soon slowed down and the liquid eventually cleared at a specific gravity of 1.028, the Dabinet juice continued to ferment and remained cloudy until the specific gravity had dropped below 1.010, when the liquid cleared somewhat. Thus, in the former case a sweet, and in the latter a dry, cider resulted. The following table gives the comparative rates of fermentation at different periods, the specific gravities being taken from samples kept in the laboratory at a temperature varying between 55° F. and 70° F.

CHISEL JERSEY—		Jan. 4	Feb. 20	May 1	Dec 29
Unfiltered juice	..	1. 1.058	1.045	1.019	1.007
(two samples)	..	2. 1.058	1.042	1.016	1.007
Filtered juice	..	1. 1.058	1.043	1.020	1.014
(two samples)	2.	1.058	1.044	1.029	1.021

DABINET—		Jan. 4	Feb. 20	May 1	Dec. 29
Unfiltered juice	..	1. 1.054	1.030	1.006	1.001
(two samples)		2. 1.054	1.033	1.004	1.000
Filtered juice	..	1. 1.054	1.038	1.014	1.009
(two samples)		2. 1.054	1.038	1.016	1.007

It will be seen, therefore, that the filtration of the fresh juice did not materially alter the course of natural fermentation, there being in neither case a large difference in the final specific gravity, nor was there any material difference in the flavour, apart from the extra sweetness in the filtered examples. There was certainly no advantage gained sufficient to compensate for the trouble of filtration. Better results, from the point of view of checking fermentation, could have been obtained by delaying filtration until active fermentation had been in progress some time. During the present season further experiments are being carried on to determine at which stage of fermentation filtration is of most service, and also to ascertain to what degree fermentation can be controlled at any stage by filtration or other means, apart from the use of preservatives.

THE INFLUENCE OF YEASTS AND BACTERIA ON FLAVOUR.

YEASTS.—The experiments in this subject, which were started during the season 1904-5, have been continued during the past season and are being carried on more extensively during the present season. Including tests on a limited scale in the laboratory as well as those on a practical scale in the cider-house, more than one hundred different kinds of yeast are being or have been examined. Last season it was not possible to obtain sufficient juice of one kind to carry on the experiments at the Institute on a practical scale, but Mr. James Watts, of Backwell, kindly placed a quantity of fruit at our disposal at his factory and the work was consequently carried on there.

Two series, A and B, of tests were made, the juice used in the first being obtained from a mixture of Cap of Liberty and White Jersey apples, in the proportion by weight of 1-6th of the former to 5-6ths of the latter; while in the second a mixture of 1-3rd Long Stem to 2-3rds Red Jersey was used. In each case 120-gallon casks were filled with the fresh juice direct from the press, and every cask was infected as soon as possible with a special kind of yeast, one, however, in each series being left uninfected, so that the cider produced by natural fermentation could be compared with those fermented by the special yeasts. The following tables of specific gravities show the course of fermentation in each instance:—

SERIES A, pressed Nov. 21st, 1905, 5-6ths White Jersey, 1-6th Cap of Liberty :—

			Nov. 23	Nov. 30	Dec. 6	Dec. 13	Dec. 20	Jan. 3	Jan. 10
Yeast C.	..	..	1.052	1.047	1.041	1.031	1.024	1.018	1.011
„ D.	..	..	1.052	1.050	1.044	1.033	1.026	1.016	1.011
„ E.	..	..	1.052	1.050	1.045	1.034	1.027	1.017	1.012
„ F.	..	..	1.054	1.051	1.044	1.033	1.026	1.020	1.013
„ G.	..	..	1.052	1.050	1.045	1.036	1.023	1.020	1.012
Natural fermentation	..	..	1.053	1.050	1.046	1.037	1.031	1.022	1.016

SERIES B, pressed Dec. 6th, 1905, 2-3rds Red Jersey, 1-3rd Long Stem.

			Dec. 6	Dec. 13	Dec. 20	Jan. 3	Jan. 10
Yeast A.	..	..	1.058	1.053	1.046	1.041	1.032
„ D.	..	..	1.058	1.053	1.050	1.042	1.034
„ H.	..	..	1.059	1.055	1.050	1.042	1.037
Natural fermentation	..	..	1.060	1.055	1.052	1.044	1.039

On examination on December 17th, 1906, as far as flavour was concerned, in Series A, D proved the best (sp. gr. 1.000), G (sp. gr. 1.000), C (sp. gr. 1.000), E (sp. gr. 1.0005), natural fermentation (sp. gr. 1.0005), and F (sp. gr. 1.000) following in the order given. In Series B, A (sp. gr. 1.015), was the best, followed by H (sp. gr. 1.008), D (sp. gr. 1.006), and natural fermentation (sp. gr. 1.008) as placed. The same general character existed in each cider of the respective series, for which result the character of the fruit used must be accounted responsible ; but there were distinct variations in flavour in the different specimens, sufficient in some cases to render the general result pleasant or unpleasant, which were undoubtedly due to the character of the yeast used. The most interesting result was that, in every instance except one, the ciders fermented with special yeasts proved superior to those naturally fermented. In order to make the test as thorough as possible, when comparing the ciders, the identity of each was not disclosed until the order of merit was decided.

It is hoped, when the results of the present season's tests are complete, to publish in full detail an account of the whole series of experiments with cider yeasts.

ACETIC BACTERIA. —Up to the present time the studies of the influence of organisms on the flavour of cider have been mainly confined to the different kinds of yeasts. Undoubtedly, however, bacteria play a very important part in many cases. The best known

example is the acetic bacterium, which, if allowed to develop unchecked, will eventually convert the cider into vinegar. While its action is reduced as far as possible by all good makers, yet, even with the most careful management, under ordinary circumstances some acetification occurs normally. There are two periods when it appears to take place to an appreciable extent: the first, when the juice is freshly pressed and active alcoholic fermentation has not yet begun, and the second, when active fermentation has ceased. The opportunity for the bacterial action is afforded in each instance by the lack of carbonic acid gas development, the acetifying organism being capable only of active growth in the presence of oxygen. In the former case, since the greater the surface of liquid exposed to air the more favourable are the conditions for acetification, the practice of keeving in open vats or casks is particularly conducive to this action, unless the juice is brought into a state of alcoholic fermentation rapidly by the addition of yeast. The fruit itself also undergoes some acetification, the extent of which becomes serious, if its condition is wet or badly bruised and, especially, if it is allowed to heat. The more serious instances of acetification occur after active fermentation ceases. Even although casks may be filled to the bung-hole and tightly bunged, air appears to reach the cider in most kinds of casks in general use. In some instances, if the cider is stored for a length of time, a considerable amount of evaporation takes place, with the result that a large air space is formed in the cask above the liquid and, consequently, a correspondingly large amount of acetification occurs. The flavour of the cider is affected according to the extent of the action. Normally, if the proportion of acetic acid is kept very low, its influence on flavour may not be prejudicial, since a compound of that substance with alcohol is formed which adds to the bouquet and aroma. Larger quantities, however, reduce the quality seriously. Since acetic bacteria appear to occur invariably in fresh juice, it follows that they must always exert some influence on the flavour; and, at the same time, their presence renders it necessary to work under conditions which will reduce their activity to the lowest possible limits.

AROMATIC BACTERIA.—During the past season the properties of various other bacteria which are found in cider have been investigated. Of these, one appears to be particularly interesting and important on account of the preponderating influence which it is capable, under favourable circumstances, of exerting on the flavour and aroma of cider. The fresh juice or cider in which it develops acquires a strong aroma and flavour, very similar to that of aniseed. Opinions of cider makers and others who have sampled

ciders affected by its action appear to be much divided as to its desirability, some disliking its nature and others regarding it as a feature of considerable value. Certainly these ciders possess a unique and characteristic flavour, and, as representing a special type, may be considered valuable in the same sense as those made from varieties with strongly developed and peculiar characteristics of their own, such as Foxwhelp and Cowarne Red. The first cases met with at the Institute were the Dabinet and Harry Masters ciders, made in January, 1905. These were keeved in the usual manner. It was noticed that, after they had been in the keeves for three or four days, a thick creamy-looking slimy head had developed on the surface of the juice, and that a peculiar aniseed-like odour was given off. At the time, the matter was not further investigated, but, in consequence of similar features occurring in October and November, 1905, in keeves, containing juices from Belle Norman and Ashton White apples, a portion of the slimy head was examined microscopically and found to consist almost entirely of a mass of bacteria. Special cultures having been made, it was found that the phenomena were due to one particular form, which was then isolated and kept in pure culture until opportunity for a more detailed study of its characters arose. An extended description of this organism and its properties cannot be given here, but, so far as its influence on cider is concerned, it may be briefly stated that:—

- (1) When it grows vigorously in fresh apple juice, the resulting cider acquires the characteristic flavour and aroma which, while losing its strength somewhat as the liquor ages, is nevertheless still easily detected in two-year-old cider.
- (2) Its effects may be produced in ciders if a vigorously growing culture of the organism be added to the freshly pressed juice.
- (3) All ciders do not appear to be equally liable to its attacks. Sweet and bitter-sweet juices are most favourable for its development.
- (4) The characteristic flavour and aroma are produced by the action of the organism on one kind of sugar only, viz., laevulose or fruit sugar. Grape sugar and cane sugar do not appear to be affected in this manner under ordinary conditions.
- (5) Although its influence is not noticeable to any striking extent in most ciders, there is evidence that it is frequently present in freshly pressed juices, the conditions, however,

as a rule, not favouring its development to a sufficient extent to allow of its influence becoming appreciable.

- (6) The practice of keeving favours its development, by the exposure of a large surface of the juice to the air.

CIDER SICKNESS.—Cider sickness is a disorder of cider, commonly met with in some districts, which constitutes another instance of the influence of organisms on flavour. Thanks are due to Mr. W. D. McCreath and others for kindly supplying much valuable information regarding this disorder, as it occurs in practice, and for obtaining samples for examination. It usually makes its appearance during the middle or latter half of the summer, hot weather probably favouring its development. It occurs in cider, both in cask and in bottle. In some cases the liquid becomes very turbid, while in others it remains clear but throws down a heavy deposit. A large evolution of gas occurs and hence the trouble is frequently referred to as "second fermentation." It is, in fact, a special type of fermentation, which is distinguishable from normal alcoholic fermentation, whether "primary" or "secondary," by the development of a peculiar disagreeable odour and flavour, due possibly, in part at least, to the formation of acetaldehyde. The cider is rendered almost unsaleable and the loss to the maker is especially great, because, as a rule, they are the sweetest, richest, and most fruity ciders which are most subject to its attacks. The investigation is not yet complete, but some definite results have already been obtained, and may be briefly summarised as follows:—

- (1) The disorder is due to the action of a special organism or organisms.
- (2) It is possible to cause the development of "sickness" in a sound cider by infecting the same with a small quantity of "sick" cider. In other words "sickness" is contagious.
- (3) All ciders are not equally susceptible to the disorder. The results obtained from experiments in which sound ciders have been artificially infected tend to prove that its development only occurs in those wherein normal alcoholic fermentation is practically at a standstill. Thus, ciders which ferment naturally very slowly and cease to ferment while the specific gravity is still high, *i.e.* naturally sweet ciders, are most liable.
- (4) Ciders with a low percentage of acidity appear to be less resistant to infection than those with a high percentage.
- (5) A high temperature is much more favourable to the development of "sickness" than a low one.

In many respects, the disorder appears to resemble those known as "Zickendwerdend" to German wine and cider-makers, and as the "turning" of beers to brewers. In those disorders a lactic acid fermentation occurs, which is due to the development of lactic acid bacteria. The presence of lactic acid in several "sick" ciders examined at the Institute has been detected, and lactic acid bacteria have also been isolated from these samples. Infection experiments have thus far failed to prove that these organisms are the sole cause of cider sickness, although it appears likely that they play some part, possibly in co-operation with other organisms of a different kind.

It is improbable that a cure for "sickness" will be found which will be of practical use, since the flavour of the affected cider is radically altered; although it may be mentioned that in some instances the trouble seems to pass off after a time and the flavour to recover itself partially, but never completely. From the maker's point of view, prevention is much more important than cure. The results which have just been quoted point clearly to the means of prevention. As with living organisms, so with ciders, the susceptibility to, or immunity against, disease germs depends on the powers of resistance of the individual rather than on the presence or absence of the germs. In the case of cider, there is always the possibility, and indeed the probability, that the germs of "sickness" may be present in the freshly pressed juice, or, going back further still, on the fruit itself. The immunity of these ciders must depend on certain properties or qualities of the juice itself, otherwise it would be impossible to make any sound cider. The experimental work proves that the essential property for immunity is a capacity for continued normal healthy alcoholic fermentation, *i.e.*, the fresh juice must contain sufficient nitrogenous matter to promote a steady primary fermentation. The management of the juice must also be such that, after the cider is obtained in a condition fit for finally bunging down in the store cask, or for bottling, fermentation shall not entirely cease but continue very slowly. The percentage of acidity ought not to be too low, and the temperature of the mature cider should be kept as low as possible.

It is hoped that members of the Institute and others interested in cider-making will send samples of any varieties of cider or perry fruit which they consider worthy of special investigation, to be tested at the Institute. Every endeavour to furnish information as to their value for vintage purposes will be made, and also advice for their use in blending will be given, if desired.

REPORT BY J. ETTLE, F.R.H.S.

THE ORCHARDS.

As mentioned in previous reports, the young orchard was planted with trees worked on what were termed the "Hereford" and "Somerset" systems respectively, in alternate rows. The Herefords were grafted or budded close to the ground with varieties which have to make their own stems and heads; while the Somersets, being strong varieties of the Morgan Sweet and Broadleaf type, were grafted on the crab stock to make strong stems and well shaped heads, to be eventually bough grafted. They have all continued to grow exceptionally well, without the aid of manure, excepting a dressing of muriate of potash and superphosphate in the spring to harden the wood and make it less susceptible to canker.

With the exception of a few Broadleaves and Court Royals which have been left to fruit, all the Somersets have been bough grafted, and the grafts, particularly those put on latest in the season, have taken, and are growing well. As in 1905, grafts put on early in May have done much better than others put on three weeks or a month earlier, when the weather was colder and the sap not flowing so freely. The same remark applies to the grafted stocks in the nursery. It will be understood that where so many have to be grafted some must be done early.

In 1905, one row of trees of twenty varieties was grafted with Kingston Blacks, to test eventually what effect the intermediate stock has on the juice. These being done the first in the season and a week of very cold weather ensuing, did not take well, so this year they were cut harder back and again grafted with Dabinets, a variety well known in the Martock district of Somerset as a free grower, a good bearer, and a very good one for cider either alone or blended. This has done very satisfactorily, and the grafts are growing well.

The following have been used for head grafting the "Somersets":—Somerset and Devon varieties:—Sweet Alford, Harry Masters, Yarlington Mill, White Jersey. Cap o' Liberty, and Royal Jersey. French varieties:—Reinette Obry, M. Jacques, Cremiere, Ecarlatine, Rouge de Treves, Tardive Forestier, Frequin Audievre, and Bedan des Parts.

The experiments designed to test the effect of the presence or absence of grass on the growth of young trees have been carried a step further during the past year. The cultivated ground, 6ft.

in diameter, in which the trees were planted, has with some been extended to 9ft. in diameter, with others left as it originally was, and with others allowed to grass over again. It is of course much too early to give any results, but the girth of the trees was carefully measured at 5ft. 6in. from the ground in the spring of the year, and this will be continued each year at the same time.

In this young orchard the prejudicial effect of elm trees or their roots on the growth of young trees planted near them has been very noticeable, as on measuring day the girths of these young trees were less than half of others in the centre of the field.

All the trees were sprayed with caustic wash, both in the young and old orchards. This cleared the old trees of moss, &c., but had little effect on the eggs of American Blight and Scale. The old trees have borne heavy crops of apples this year, sufficient to make about 30 hogsheads of cider, besides a quantity (Morgan Sweets) sent to market. The old trees were all given dressings of liquid manure which has, no doubt, assisted them. No other manurial experiments were tried, as satisfactory results could not be looked for, no two trees being of the same age or size.

THE PLANTATIONS.

All the apple and pear trees have made good growth excepting Stirling Castle, which has not grown so strongly but is making good fruiting wood. Very little experimenting with methods of pruning has been done, as the young trees had to be cut back hard to form their heads. An exhaustive scheme of experiments has been prepared and will be commenced this season, with root-pruning, summer-pruning and "extension" *versus* "restrictive" branch pruning. This applies to the acre plantation. Nearly all the currants and other small bush fruit have made excellent growth, the only weak one being Crown Bob Gooseberry. In this same acre the strawberries have fruited for the first time, the blooms having been pinched off in 1905, as the runners had been planted late. Eight varieties are under trial, 600 plants of each. It is very curious that Noble has done badly, as it generally crops heavily in the district. Waterloo also does well only about three miles away. Paxton has been the favourite with the small market growers round, but has not borne so well as several others. Of the currants, the White Dutch has cropped very heavily. It should be explained that a sixteenth of an acre is given to each variety of currant, gooseberry and raspberry, with the exception of The Guinea, which has only one row, outside the acre.

The strawberries, of course, are planted between the other fruits in rows 5ft. apart, and the plants 2ft. in the rows.

Nearly all the small fruits were sold on commission by Rowland Adams & Co., of Bristol, who were also able to fetch them as they were ready. A fair amount were also bottled, but have not yet been sold.

The returns from the different varieties were as follows :—

LIST OF QUANTITIES IN LBS. FROM THE ACRE.

STRAWBERRIES.

		1st GRADE.	2nd GRADE.	TOTAL.
Royal Sovereign ..	..	125	53½	178½
Monarch ..	..	193	85½	278½
President ..	..	177	59	236
Vicomtesse ..	..	95	150	245
Noble ..	..	38	12	50
Waterloo ..	..	46½	3	49½
Latest of All ..	..	158½	36	194½
Sir Joseph Paxton ..	..	135½	4½	140.
		978½	403½	1382

RED CURRANTS.

Fay's Prolific	30½
Knight's Sweet Red	48
Raby Castle	28
		107

WHITE CURRANTS.

White Dutch	103
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BLACK CURRANTS.

Baldwin's..	..	145
Carter's Champion..	..	139
Lee's Prolific	134
Black Naples	149
		567

GOOSEBERRIES.

		PICKED GREEN.	TOTAL.
Whinham's Industry ..	..	20	69
Crown Bob ..	..	20	40½
Lancashire Lad ..	..	15	50
Keepsake ..	..	20	70
			230

RASPBERRIES.

Northumberland	Fill	Basket	100
Norwich Wonder	..	..	81
Hornet	..	..	72
Superlative	..	..	97
Guinea	..	..	3
			<hr/>
			353

AMOUNTS RECEIVED.

			£	s	d.
Strawberries	..	..	30	7	0
Currants	..	..	12	1	2½
Raspberries	..	..	6	9	8
Gooseberries	..	..	1	3	1½

In the half acre newly planted last year are 24 varieties of apples, and the same number of gooseberries, with 8 of raspberries, as mentioned on pp. 155 and 156 in the last report. A few loganberries, wineberries, and blackberries were planted at the ends of the rows to ramble up posts. As a ground crop, strawberries are planted from runners obtained in 1906. There having been a difference of opinion as to whether the first or second runner from the parent plants fruits the better, four rows of each are being tried, 50 in a row.

Sufficient runners have also been layered to fill in the other half acre of pears and plums, which are to be planted this season. Unfortunately, this planting has been delayed through all hands being busy with apple gathering and cider-making.

THE NURSERY.

The two years old apples and pears have made splendid growth, some of the stronger varieties being 8 to 9 ft. high. Most of those budded in 1905 or grafted in 1906 are doing exceedingly well. Of the former there are about 3,000, and of the latter about 4,500. There are also about 600 two years old apple trees on the Paradise, which will be mentioned later. Of the 3,000 two year olds, the majority will be ready for distribution to the contributing counties in 1908, to form experimental orchards. Some will be good-sized trees by the end of 1907, but it is better to give them another year in the Nursery. The 600 apples on the Paradise are nearly all the same as those worked on the seedling apple and crab stocks. They are to be planted out in a new piece of ground as a plantation, in order to give a supply of grafts and also fruits for exhibition purposes.

Another half acre of nursery is to be planted with pear and apple stocks for propagating other varieties.

APPENDIX.—ANALYSES OF APPLES AND PEARS.

Name of Variety.	Specific Gravity.	PERCENTAGE COMPOSITION OF JUICE.					Grower.	District.	
		Solids.	Total Sugar.	Malic Acid.	Tannin.	Extrac- tives.			
APPLES.									
ANSELL	1.0568	14.12	12.73	.43	.186	.774	J. Shipp ..	Breadstone	
BACKWELL RED ..	1.0487	11.80	10.68	.56	.050	.510	G. R. Horler ..	Buckwell	
BELL	1.0582	14.42	13.24	.18	.120	.880	J. Crofts ..	Sutton Montis	
BRICE'S KERNEL ..	1.0482	11.62	10.80	.70	.060	.060	T. Garland ..	Lydney	
BROADLEAF NORMAN ..	1.0535	12.82	12.09	.23	.292	.208	R. Neville-Grenville ..	Butleigh	
BROCK'S No. I. ..	1.0510	12.66	11.19	.21	.068	1.192	J. Brock ..	Long Ashton	
BUTLEIGH, No. XIV. ..	1.0918	23.38	20.89	.20	.432	1.858	R. Neville-Grenville ..	Butleigh	
Do. No. XVIII. ..	1.0653	15.40	14.00	.51	.210	.680	Do. ..	Do.	
Do. No. XXI. ..	1.0600	15.18	13.24	.33	.144	1.466	Do. ..	Do.	
BUTLER'S RED ..	1.0588	14.00	12.37	.51	.134	.986	W. Butler ..	Long Ashton	
BUTLER BOX ..	1.0405	9.48	8.45	.50	.110	.420	C. E. Pole-Carew ..	Littlehampton	
CAP OF LIBERTY ..	1.0631	15.18	13.82	.93	.300	.130	J. H. Symes ..	Martock	
Do. ..	1.0720	17.26	15.55	1.18	.420	.110	R. Neville-Grenville ..	Butleigh	
CARDIVE FORESTIER ..	1.0570	14.30	12.73	.30	.740	.530	A. Brown ..	Failand	
CHAPMAN'S WALL SEEDLING ..	1.0600	15.68	—	.59	.116	—	G. F. Chapman ..	Draycott	
CHERRY NORMAN ..	1.0549	13.60	12.20	.14	.352	.908	A. Longville ..	Moccas	
CHISEL JERSEY ..	1.0686	16.40	15.31	.22	.610	.260	J. H. Symes ..	Martock	
CLUSTER JERSEY ..	1.0520	12.84	11.60	.20	.196	.844	Do. ..	Do.	
COOK'S A. SCARLET ..	1.0710	17.08	15.91	.22	.660	.290	R. Neville-Grenville ..	Butleigh	
COUNSELLORS ..	1.0712	17.30	15.16	.17	.450	1.520	I. Rimmels ..	Buxley	
COURT ROYAL ..	1.0550	13.60	12.37	.14	.148	.942	R. Neville-Grenville ..	Butleigh	
COWARNE RED ..	1.0540	13.46	12.05	.65	.230	.530	R. Skyrme ..	Byford	
CREMIERE ..	1.0503	12.96	11.13	.32	.074	1.436	A. Brown ..	Failand	
DABINET ..	1.0520	12.94	11.81	.19	.238	.702	J. H. Symes ..	Martock	
DAVIS' FAVOURITE ..	1.0123	10.76	9.60	.18	.188	.792	H. J. Davis ..	Sutton Montis	

DOUCE AMERE	..	1.0650	15.56	14.68	27	.122	.488	A. Brown	..	Failand	S.
DUFFLIN	..	1.0720	17.24	15.41	.91	.198	.722	J. C. Danbuz	..	Truro	S.
FOXWHELP	..	1.0590	14.26	13.24	83	.324	—	R. Neville-Grenville	..	Butleigh	S.
FREDERICK	..	1.0550	12.88	11.46	.96	.048	.412	J. Howells	..	Cwmcarvon	M.
FREQUIN DE CHARTRES	..	1.0550	14.32	12.37	.19	.134	1.626	A. Brown	..	Failand	S.
FREQUIN ROUGE	..	1.0505	12.38	11.26	.32	.290	.510	J. S. Smyth-Osbourne	..	Ash	D.
GREASY REDSTREAK	..	1.0522	13.08	12.53	.14	.176	.234	J. Crofts	..	Sutton Montis	S.
HORNERS	..	1.0535	13.40	11.89	.15	.240	1.120	J. H. Symes	..	Martock	S.
HORSE'S HOF	..	1.0624	14.54	13.05	.11	.100	1.280	J. B. ock	..	Long Ashton	S.
KINGSTON BLACK	..	1.0615	14.92	13.43	.64	.204	.646	R. Harding	..	Do.	
Do.	..	1.0640	15.50	13.61	.70	.164	1.026	Cider Institute	..	Do.	
Do.	..	1.0735	17.98	15.41	.71	.208	1.652	J. Shipp	..	Breadstone	G.
Do.	..	1.0702	17.28	14.46	.68	.202	1.938	J. H. Symes	..	Martock	S.
LADY'S FAVOURITE	..	1.0593	14.36	12.25	.75	.128	1.232	R. Neville-Grenville	..	Butleigh	S.
LAMBROOK PIPPIN	..	1.0571	13.28	12.73	.58	.242	—	J. H. Symes	..	Martock	D.
LANGWORTHY	..	1.0510	12.54	10.80	.47	.124	1.146	T. M. Pope	..	Copplestone	D.
LORAM'S SWEET WHITE	..	1.0691	17.28	14.92	.27	.124	1.948	E. T. Loram	..	Alphington	D.
MAJOR	..	1.0599	14.66	13.62	.19	.400	.450	J. S. Smyth-Osbourne	..	Ash	D.
MASTER'S JERSEY	..	1.0625	15.44	13.82	.19	.310	1.120	C. Osborn	..	Woolston	S.
MEDAILLE D'OR	..	1.0560	13.70	13.05	.22	.400	.030	A. Brown	..	Failand	S.
MONS JACQUES	..	1.0535	12.62	12.25	.32	.376	—	Do.	..	Do.	
MUSCADET	..	1.0618	15.48	14.46	.17	.196	.654	Do.	..	Do.	
NEVER-DECEIVE-ME	..	1.0649	15.48	13.82	.37	.196	1.094	R. Neville-Grenville	..	Butleigh	S.
NOIR DE VITRY	..	1.0497	12.48	11.26	.23	.092	.898	A. Brown	..	Failand	S.
NORTHWOOD	..	1.0600	14.60	13.24	.24	.220	.900	E. T. Loram	..	Alphington	D.
PAGE'S YELLOW	..	1.0670	16.76	14.92	.58	.082	1.178	T. Garland	..	Lydney	G.
POPLE'S GUTTER	..	1.0471	11.36	10.65	.258	.258	—	G. R. Horler	..	Backwell	G.
PRINCE ALBERT	..	1.0700	12.96	15.16	.33	.600	1.170	J. Shipp	..	Breadstone	S.
PYTHERES	..	1.0510	12.98	11.19	.15	.196	1.444	J. Howells	..	Cwmcarvon	M.
REDSTREAK	..	1.0582	14.68	13.06	.18	.268	1.172	J. Crofts	..	Sutton Montis	S.
ROYAL WILDING	..	1.0570	13.80	11.60	.26	.156	1.784	W. Guilding	..	Suedgeley	G.
Do.	..	1.0657	16.14	13.82	.34	.310	1.670	G. E. Lloyd-Baker	..	Hardwicke	G.
SEEK-NO-FURTHER	..	1.0493	11.48	10.77	.58	.052	.078	Cider Institute	..	Long Ashton	S.
SKYRME'S KERNEL	..	1.0495	11.72	10.88	.55	.172	.118	R. Skyrme	..	Byford	H.
STRAWBERRY NORMAN	..	1.0568	13.98	12.70	.33	.430	.520	W. Price	..	Mansell Gamage	H.
SWEET ALFORD	..	1.0593	15.12	13.43	.15	.134	1.406	E. T. Loram	..	Alphington	D.

APPENDIX.—ANALYSES OF APPLES AND PEARS.—*continued.*

Name of Variety.	Specific Gravity.	PERCENTAGE COMPOSITION OF JUICE.					Grower.	District.	
		Solids.	Total Sugar.	Malic Acid.	Tannin.	Extrac- tives.			
APPLES— <i>continued.</i>									
SWEET ALFORD ..	1.0480	12.74	10.93	.14	.088	1.582	J. S. Smyth-Osbourne	Ash	D.
SYMES SWEET ..	1.0521	13.04	11.60	.15	.214	1.076	J. H. Symes ..	Marlock	S.
TANNERS A. ..	1.0770	18.66	17.19	.24	1.180	.050	R. Neville-Grenville	Butleigh	S.
Do. B. ..	1.0663	15.86	15.31	.24	.880	—	Do.	Do.	
TING HARVEY ..	1.0588	14.24	13.06	.34	.264	.576	C. E. Pole-Carew ..	Littlehampton	D.
TOM PUTT ..	1.0519	13.18	11.32	.62	.110	1.130	E. V. V. Wheeler ..	Tenbury	W.
Do. Do... ..	1.0523	12.62	11.89	.56	.110	.060	Cider Institute ..	Long Ashton	H.
WHITE NORMAN ..	1.0537	13.36	12.20	.14	.300	.720	J. Helme ..	Weobley	D.
WOODBINE ..	1.0620	15.36	13.82	.18	.150	1.210	E. T. Loram ..	Alphington	S.
YARLINGTON MILL ..	1.0528	12.93	11.75	.23	.400	.580	C. Osborn ..	Woolston	G.
YELLOW STYRE ..	1.0747	18.70	15.91	.49	.148	2.152	T. Garland ..	Lydney	S.
CROFTS' No. I. ..	1.0562	14.58	13.05	.18	.250	1.100	J. Crofts ..	Sutton Montis	D.
Do. No. II. ..	1.0562	13.80	13.24	.18	.100	.280	Do. ..	Do.	
Do. No. III. ..	1.0692	16.84	15.08	.17	.206	1.384	Do. ..	Do.	
SMYTH-OSBOURNE'S No. I. ..	1.0560	13.94	12.05	.20	.206	1.484	J. S. Smyth Osbourne	Ash	
Do. No. II. ..	1.0597	14.68	13.62	.18	.204	.676	Do. ..	Do.	
Do. No. III. ..	1.0615	14.54	13.06	.19	.210	1.080	Do. ..	Do.	
Do. No. V. ..	1.0590	14.80	13.05	.19	.110	1.450	Do. ..	Do.	
Do. No. VI. ..	1.0561	14.42	12.20	.21	.076	1.934	Do. ..	Do.	
Do. No. VII. ..	1.0700	16.92	15.16	.23	.118	1.412	Do. ..	Do.	
POLE-CAREW'S No. III. ..	1.0490	11.28	10.21	.86	.112	.098	C. E. Pole-Carew	Littlehampton	D.
Do. No. IV. ..	1.0565	13.60	12.09	.40	.060	1.050	Do. ..	Do.	
Do. No. VI. ..	1.0475	11.14	10.21	.53	.130	.270	Do. ..	Do.	
Do. No. VII. ..	1.0653	15.52	14.63	.14	.480	.270	Do. ..	Do.	
Do. No. VIII. ..	1.0623	15.32	14.85	.16	.380	—	Do. ..	Do.	
Do. No. X. ..	1.0890	20.58	19.56	.39	.374	.256	Do. ..	Do.	

Do.	No. XII.	1.0478	11.66	10.77	.46	.096	.334	Do.	Cider	Institute	..	Do.	Long Ashton	S.
Do.	No. XIV.	1.0390	9.78	8.67	.23	.094	.786	Do.				Do.		
ASHTON BITTER WHITE		1.0543	13.68	12.20	.18	.420	.880	Do.				Do.		
Do. BROWN JERSEY		1.0470	11.56	10.42	.16	.168	.812	Do.				Do.		
Do. CODLIN	..	1.0450	10.46	10.22	.78	.088	.11	Do.				Do.		
Do. CRABS	..	1.0450	10.94	10.21	.76	.260	—	Do.				Do.		
Do. EARLY RED JERSEY		1.0500	12.64	11.06	.16	.390	1.030	Do.				Do.		
Do. EGG CRABS	..	1.0583	13.80	13.06	1.07	.260	—	Do.				Do.		
Do. LONG PODS	..	1.0593	14.36	13.24	.59	1.126	.404	Do.				Do.		
Do. RUSSET JERSEY		1.0642	15.60	15.16	.19	.400	—	Do.				Do.		
Do. RED VALLIS	..	1.0560	13.48	12.20	.77	.156	.354	Do.				Do.		
Do. WHITE	..	1.0520	13.26	12.20	.91	.182	.450	Do.				Do.		
Do. No. 10	..	1.0585	14.04	12.73	.27	.150	.660	Do.				Do.		
Do. No. 26	..	1.0615	14.48	13.06	.61	.150	.660	Do.				Do.		
Do. No. 30	..	1.0480	11.82	10.00	.97	.360	.490	Do.				Do.		
Do. No. 38	..	1.0410	10.00	8.95	.58	.280	.190	Do.				Do.		
Do. No. 44	..	1.0430	10.60	9.69	.59	.186	.134	Do.				Do.		
Do. No. 47	..	1.0475	11.48	10.33	.82	.084	.246	Do.				Do.		
Do. No. 55	..	1.0478	11.20	10.32	.73	.266	—	Do.				Do.		
Do. No. 64	..	1.0438	9.76	9.33	.83	.346	—	Do.				Do.		
Do. No. 65A	..	1.0457	11.08	10.22	.44	.128	.292	Do.				Do.		
Do. No. 65B	..	1.0475	10.56	9.80	.80	.292	—	Do.				Do.		
Do. No. 67	..	1.0608	13.56	12.56	.80	.054	.146	Do.				Do.		
Do. No. 69	..	1.0568	13.56	12.56	.66	.172	.168	Do.				Do.		
Do. No. 70	..	1.0505	11.78	11.13	.63	.150	—	Do.				Do.		
Do. No. 75	..	1.0653	15.12	14.00	.25	.630	.240	Do.				Do.		
Do. No. 79	..	1.0568	13.48	12.40	.24	.458	.382	Do.				Do.		
Do. No. 89	..	1.0573	13.20	12.73	.23	.196	.044	Do.				Do.		
Do. No. 101	..	1.0608	13.14	12.73	1.23	.470	—	Do.				Do.		
Do. No. 109	..	1.0718	17.12	14.85	.28	.696	1.294	Do.				Do.		
Do. No. 120	..	1.0675	15.00	14.63	.75	.540	—	Do.				Do.		
Do. No. 121	..	1.0495	12.30	11.32	.67	.080	.230	Do.				Do.		
Do. No. 125	..	1.0640	15.18	14.03	.52	.130	.500	Do.				Do.		
Do. No. 130	..	1.0563	13.46	12.25	.36	.128	.722	Do.				Do.		
Do. No. 136	..	1.0630	16.00	14.03	.22	.360	1.390	Do.				Do.		
Do. No. 138	..	1.0658	15.26	13.81	.27	.610	.570	Do.				Do.		
Do. No. 142	..	1.0608	14.24	12.56	.96	1.196	.524	Do.				Do.		

APPENDIX.—ANALYSES OF APPLES AND PEARS.—*continued.*

Name of Variety.	Specific Gravity.	PERCENTAGE COMPOSITION OF JUICE.					Grower.	District.	
		Solids.	Total Sugar.	Malic Acid.	Tannin.	Extrac- tives.			
APPLES— <i>continued.</i>									
ASHTON No. 143 ..	1.0450	11.08	9.59	1.00	.260	.230	Cider Institute	Long Ashton	
Do. No. 144 ..	1.0700	16.20	15.08	.85	.106	.164	Do. ..	Do.	
Do. No. 146 ..	1.0848	20.04	18.49	.63	.096	.824	Do. ..	Do.	
Do. No. 147 ..	1.0465	11.18	10.44	.61	.110	.020	Do. ..	Do.	
Do. No. 149 ..	1.0480	10.74	10.00	1.09	.364	—	Do. ..	Do.	
Do. No. 154 ..	1.0485	11.42	10.22	1.40	.170	—	Do. ..	Do.	
Do. No. 156 ..	1.0605	13.46	12.73	.65	.110	—	Do. ..	Do.	
Do. No. 158 ..	1.0575	13.46	12.56	.89	.140	—	Do. ..	Do.	
Do. No. 159 ..	1.0690	15.44	14.63	.83	.188	—	Do. ..	Do.	
Do. No. 160 ..	1.0585	14.44	13.05	.26	.370	.760	Do. ..	Do.	
Do. No. 162 ..	1.0586	14.66	13.43	.73	.170	.330	Do. ..	Do.	
Do. No. 163 ..	1.0515	12.54	11.39	.18	.268	.702	Do. ..	Do.	
Do. No. 167 ..	1.0548	12.26	12.09	.98	.282	—	Do. ..	Do.	
Do. No. 175 ..	1.0483	11.44	10.53	.58	.128	.202	Do. ..	Do.	
Do. No. 176 ..	1.0515	12.18	11.32	.66	.106	.094	Do. ..	Do.	
Do. No. 183 ..	1.0500	11.88	10.93	.95	.200	—	Do. ..	Do.	
Do. No. 185 ..	1.0528	12.30	11.95	.38	.224	—	Do. ..	Do.	
Do. No. 190 ..	1.0608	14.32	12.89	.13	.122	1.178	Do. ..	Do.	
Do. No. 191 ..	1.0665	15.20	14.00	.34	.086	.774	Do. ..	Do.	
Do. No. 194 ..	1.0455	10.80	9.79	.84	.226	—	Do. ..	Do.	
Do. No. 197 ..	1.0875	20.60	19.21	1.00	.150	.240	Do. ..	Do.	
Do. No. 204 ..	1.0448	11.32	10.10	.27	.056	.894	Do. ..	Do.	
Do. No. 206 ..	1.0565	13.50	12.05	.58	.104	.766	Do. ..	Do.	
Do. No. 209 ..	1.0633	14.72	13.61	1.50	.170	—	Do. ..	Do.	
PEARS.									
BARLAND ..	1.0543	13.78	11.32	.62	.119	1.641	A. W. Smith..	Pershore	
BUTT ..	1.0530	12.76	11.75	.65	.270	.080	W. Gilding ..	Suedgeley	
OLDFIELD ..	1.0682	16.88	14.92	.80	.128	1.032	L. Pullin ..	Berkeley	
								W. G.	
								G.	

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